ARE 2241

LECTURE 1

INTRODUCTION TO AGRICULTURAL MECHANIZATION

INSTRUCTOR

PS Lebotsa Candidate Eng

DEPT. OF AGRICULTURAL & RURAL ENGINEERING

Mechanization advanced:
Use of agricultural drones

Learning Objectives

On completion of this topic, you should be able to:

- Define mechanization as used in agriculture
- Give examples of mechanized operations in agriculture
- Discuss the significance of mechanization in agriculture
- Define technology, with special reference to agriculture
- State the different levels of technology applied in agriculture and explain how these are linked to mechanization
- Describe the history and development of agricultural mechanization

Agricultural mechanization defined

- The application of aids (initially mechanical but lately a combination with technology) to achieve the following:
  - Increased efficiency
  - Reduced drudgery/hard work
  - Increased production
- Some of the commonly used aids include:
  - Hand operated tools, e.g. hoe, sickle, axe
  - Animal drawn/operated tools, e.g. ploughs
  - Tractor operated tools and equipment, e.g. ploughs,
  - Harvesters, e.g. combine harvester, forage harvester
  - Irrigation systems

Agricultural mechanization defined

Some of the commonly used aids include – Hand Tools

HAND SICKLE

SHOVEL & SPADE

RICE TRANSPLANTER (HAND TOOL)

HOE

PICKAXE

AXE

Agricultural mechanization defined

Some of the commonly used aids include – Animal drawn

PLANTING/ SOWING

GRASS CUTTING

CONSERVATION TILLAGE

PLOUGHING

ANIMAL-DRAWN PLOUGH

Agricultural mechanization defined

Some of the commonly used aids include – tractor operated tools

Tractor is used for very many operations in agriculture

A demonstration of precision farming technologies

Agricultural mechanization defined

Some of the commonly used aids/technologies in agriculture – Harvesters

MAIZE/CORN

WHEAT

HAY

POTATO

TEA

TOMATO

Agricultural mechanization defined

Some of the commonly used aids/technologies in agriculture – tractor powered sprayers

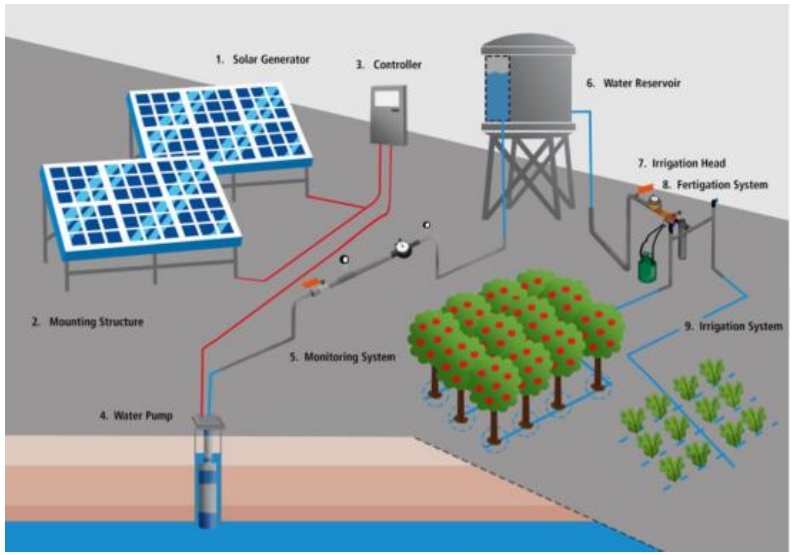
FROM SELF-PROPELLED TO MOUNTED OR TRAILED SPRAYERS

AGRICULTURAL BOOM SPRAYERS

ENGINE-POWERED KNAPSACK SPRAYER

Agricultural mechanization defined

Some of the commonly used aids/technologies in agriculture – irrigation systems

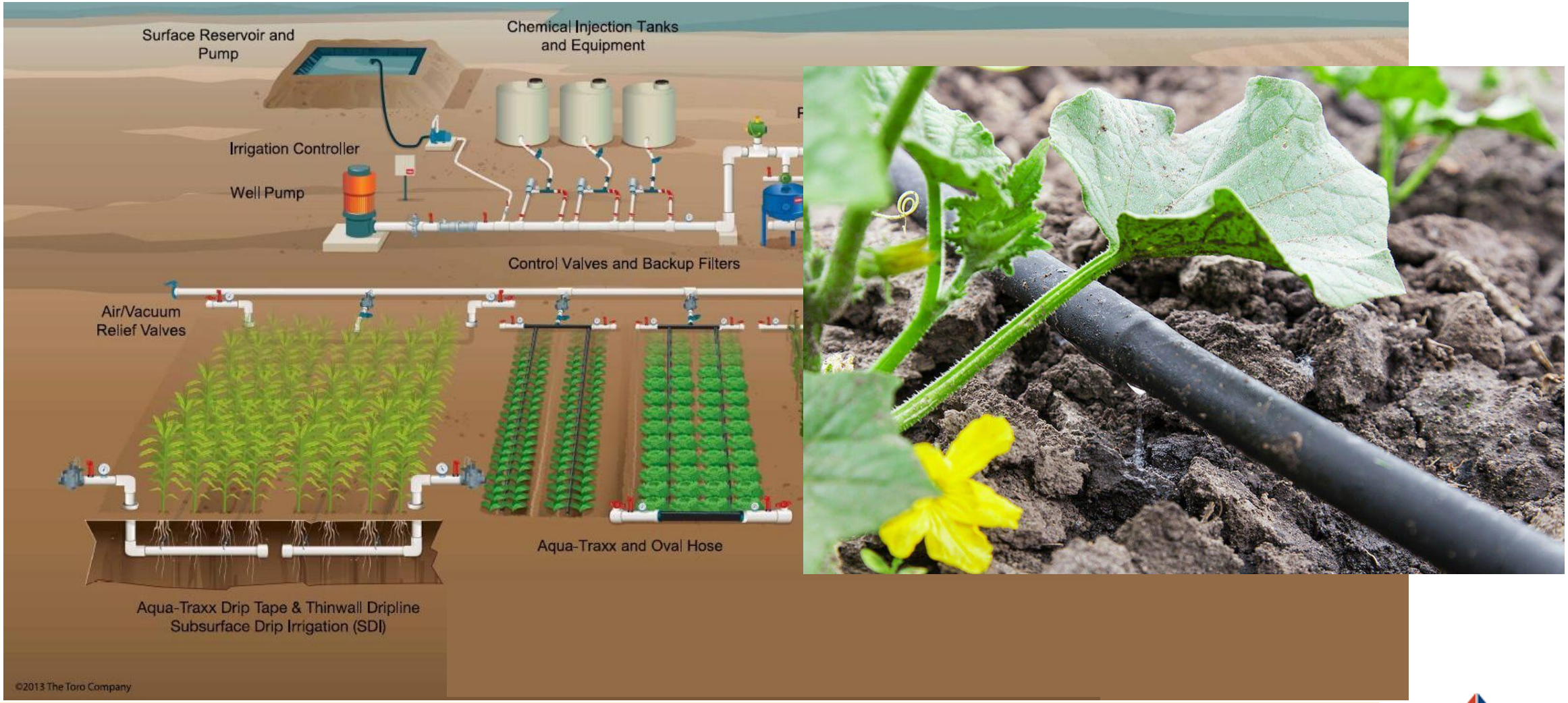


Pumped Irrigations systems take many form; simple & complex

Simple technologies

Agricultural mechanization defined

Some of the commonly used aids/technologies in agriculture – irrigation systems



Why mechanize agriculture?

- **Increased efficiency**
  - Timeliness of operations
  - And therefore, available working days
- **Increased productivity**
  - Better and sustainable land utilization – allows farming of larger areas more quickly
  - Labour saving and enhancing – morale boosting
- **Increased economic returns to farmers**
  - Empowering farmers (purchasing power - good housing, sanitation)

Why mechanize agriculture?

- **Reduced drudgery/hard work**
  - Make agriculture appealing
- **Reduced costs of production**
  - Precise & timely operations
- **Increase/create employment opportunities**

Why you should study mechanization

- **Many applications in crop production**
  - Pre-planting & planting operations
  - Crop protection
  - Food handling, storage & processing
  - Harvesting & handling operations
  - Irrigation water supply

- **Many applications in animal production**
  - Feed preparation, production & distribution
  - Waste management
  - Water supply

Why you should study mechanization

- **Many applications in the homestead**
  - Domestic water supply
  - Waste handling systems
  - Maintenance of cleanliness at home
  - **etc.**

- **Many applications in the dairy sector**
  - Milking parlours (machines, water supply, coolers, **etc.**)
  - Processing of dairy products

Misconceptions about mechanization

- Mechanization vs. tractorization
  - Use of machines vs use of tractors as a source of power
- Agricultural sector labour requirements
  - Working hours/day or per week, minimum wage
- Does mechanization interfere with good farm management practices?
  - Improves farm management
- Mechanizations vs. economics
  - God value for money

Factors affecting the mechanization process

- Agriculture is generally practiced in **rural areas**
- Comparatively, heavy capital requirements for relatively small farm sizes
- Machinery availability
- Machinery importations
- Safety considerations
- Appropriateness

Factors affecting the mechanization process

- Demographic situation & skills availability
  - Age structure and distribution
  - Migration and immigration
- Status of infrastructure
  - Communications
  - Telecommunication
  - Power supply system (capacity, distribution & availability)
  - Politics (political situation, commit to make & implement favourable policies)
  - Agricultural infrastructure

Factors affecting the mechanization process

- Land size
  - Emerging vs. established commercial farmers (e.g. ZZ2)
- Appropriateness of the available mechanization options; feasibilities of the following:
  - Technical
  - Economical
  - Social
- Mechanization options should be based on the following considerations:
  - power performance,
  - machine performance
  - labour performance

Technology & Levels of mechanization

- What is technology?
  - The application of technical knowledge involving the use of specific inputs in a specific pattern

- In agriculture
  - Biological inputs
  - Chemical inputs
  - Mechanical inputs

BIOLOGICAL INPUT

CHEMICAL INPUT

WHAT ABOUT MECHANICAL INPUTS? – GIVE SOME EXAMPLES

Technology & Levels of mechanization, cont'd

- Technology does not refer to machinery and technical skills only, but includes training programmes, organizations, management systems & development.

- Technology should serve as a link between needs and means to satisfy those need - this is the concept of Appropriate Technology

Technology & Levels of mechanization, cont'd

Traditional/ Elementary level	Appropriate/Interm ediate level	High (Automation)/Advanced level
Primitive/basic	Tech intensive	Capital intensive
Inefficient	Labour intensive	Labour saving
Non-systemized	Affordable	Sophisticated
Wasteful	Simple (cf knowledge)	Requires well-developed infrastructure
	Job creating	Labour displacing

Technology & Levels of mechanization, cont'd

- Levels of technology
  - Elementary level
    - Limited to the use of human power.
  - Intermediate level
    - Human, animal & semi-motorized (e.g. walking tractor)
  - Advanced level
    - Complete use of motorized and automated power (e.g., precision farming, remote controlled farm machines)

Technology & Levels of mechanization, cont'd

- Levels of technology
  - Elementary level (Limited to the use of human power).

HOE

HAND SICKLE

AXE

Technology & Levels of mechanization, cont'd

– Intermediate level
  - Human, animal & semi-motorized (e.g. walking tractor)

PLANTING/ S0WING

PLOUGHING

RICE TRANSPLANTER

Technology & Levels of mechanization, cont'd

– Advanced level
  - Complete use of motorized and automated power (e.g., precision farming/agriculture, remote controlled farm machines)

CHEMICAL INPUT

DRIVERLESS TRACTOR

PRECISION AGRICULTURE

Different motorized power sources for different level of mechanization

Walking tractor

Remote controlled tractor concept

Different motorized power sources for different level of mechanization

2WD Agricultural tractor

4WD Tractor

4WD Tractor

Both these are 4WD. Why?

SOME MECHANIZED AGRICULTURAL OPERATIONS

THANK YOU